

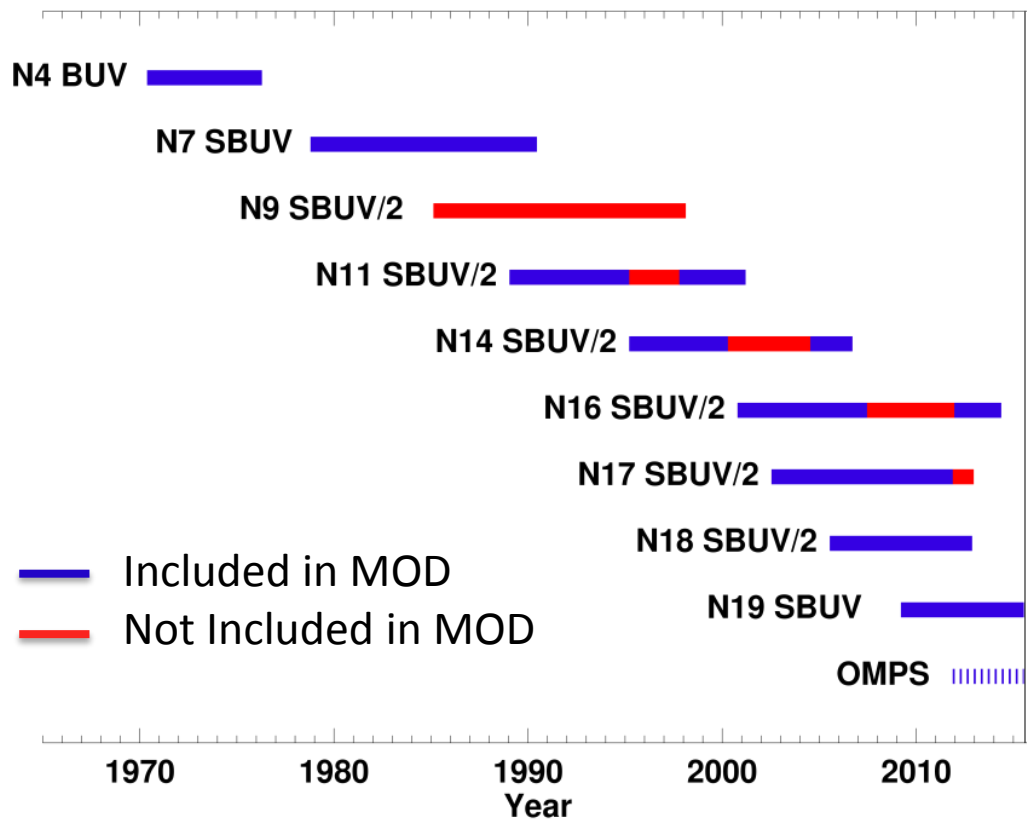


Estimating Uncertainties in the Multi-Instrument SBUV Profile Ozone Merged Data Set

Stacey Frith, Richard Stolarski

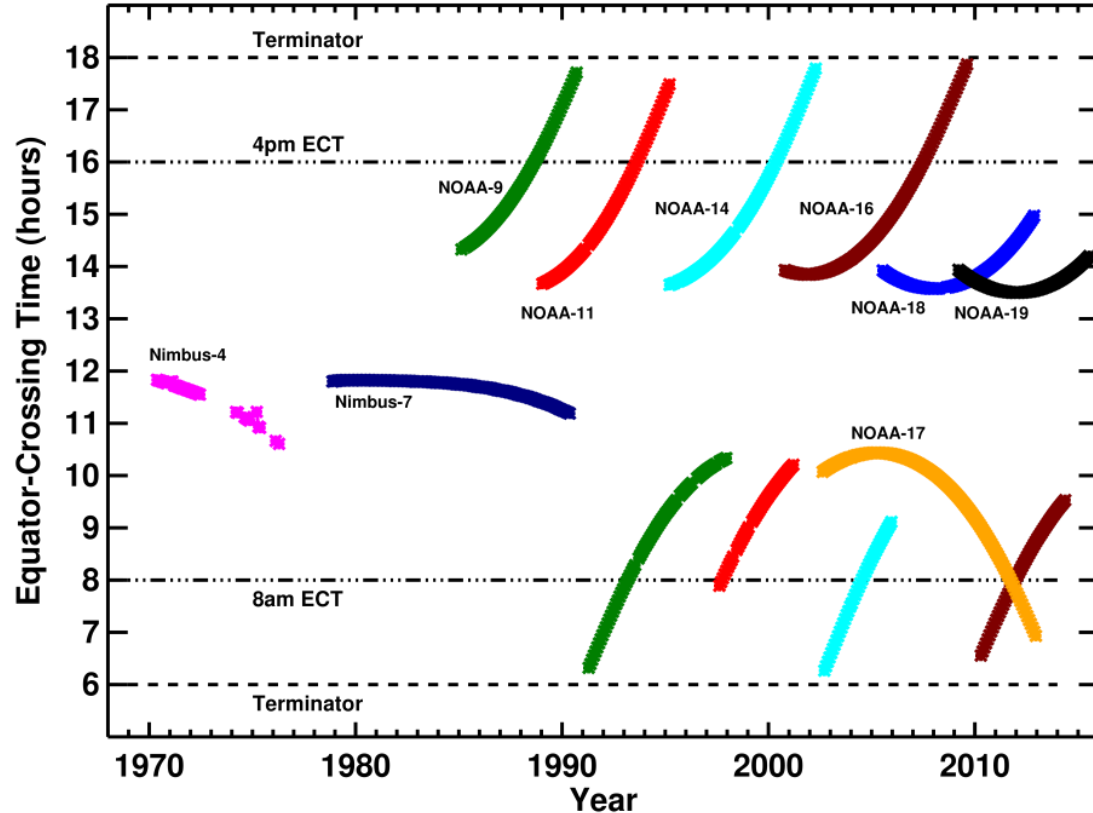
Science Systems and Applications, Inc., Lanham, MD
The Johns Hopkins University, Baltimore, MD

SBUV Satellite Series



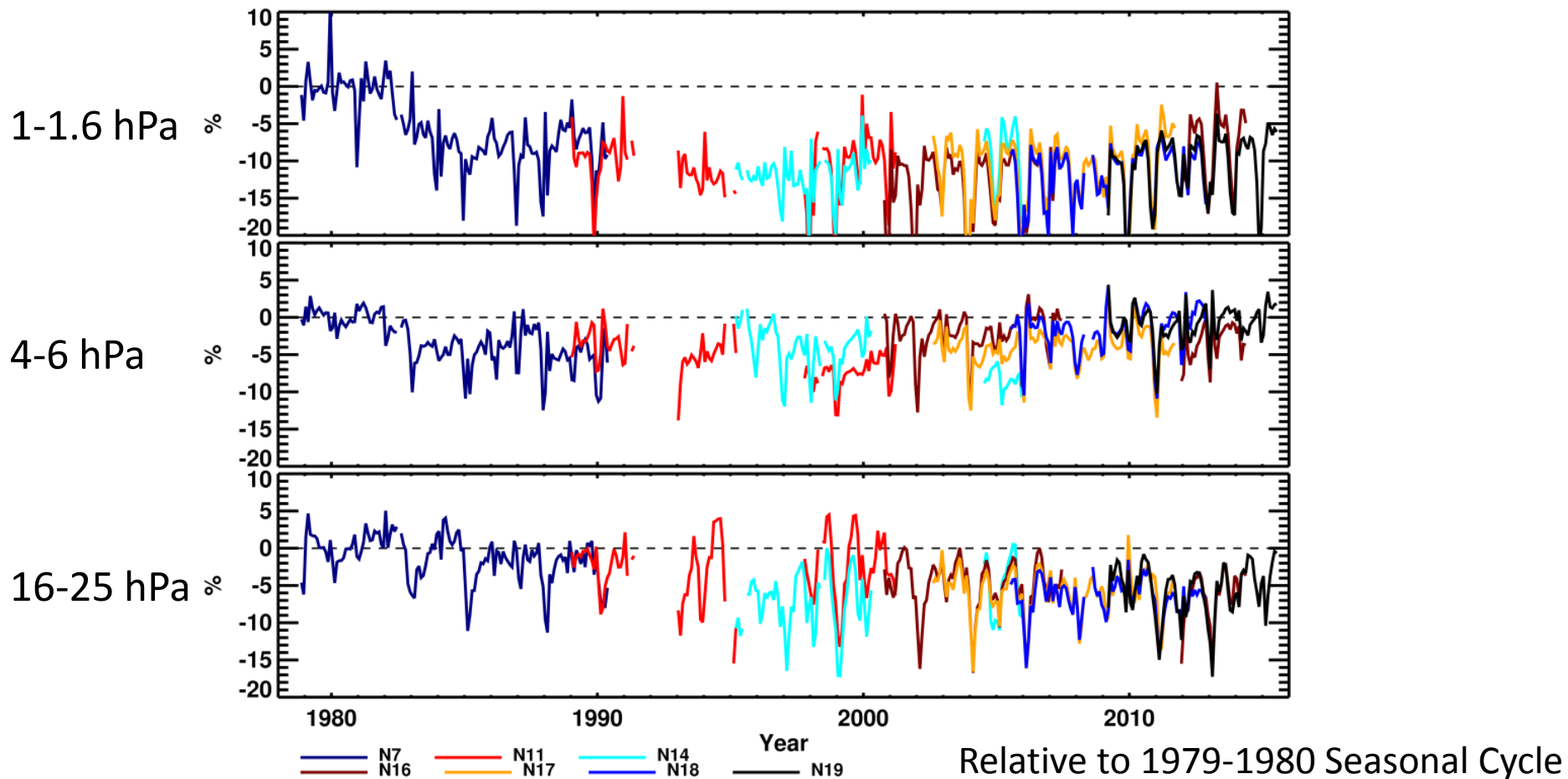
- Measures back-scattered UV radiance in nadir, 14 orbits/day.
- Vertical resolution is ~6 km at 3 hPa, decreasing above and below.
- Profile ozone retrieved using common algorithm, optimized for long-term time series analysis.
- Measurements inter-calibrated at radiance level in V8.6
- Record continues with N19/OMPS

SBUV MOD Data Selection

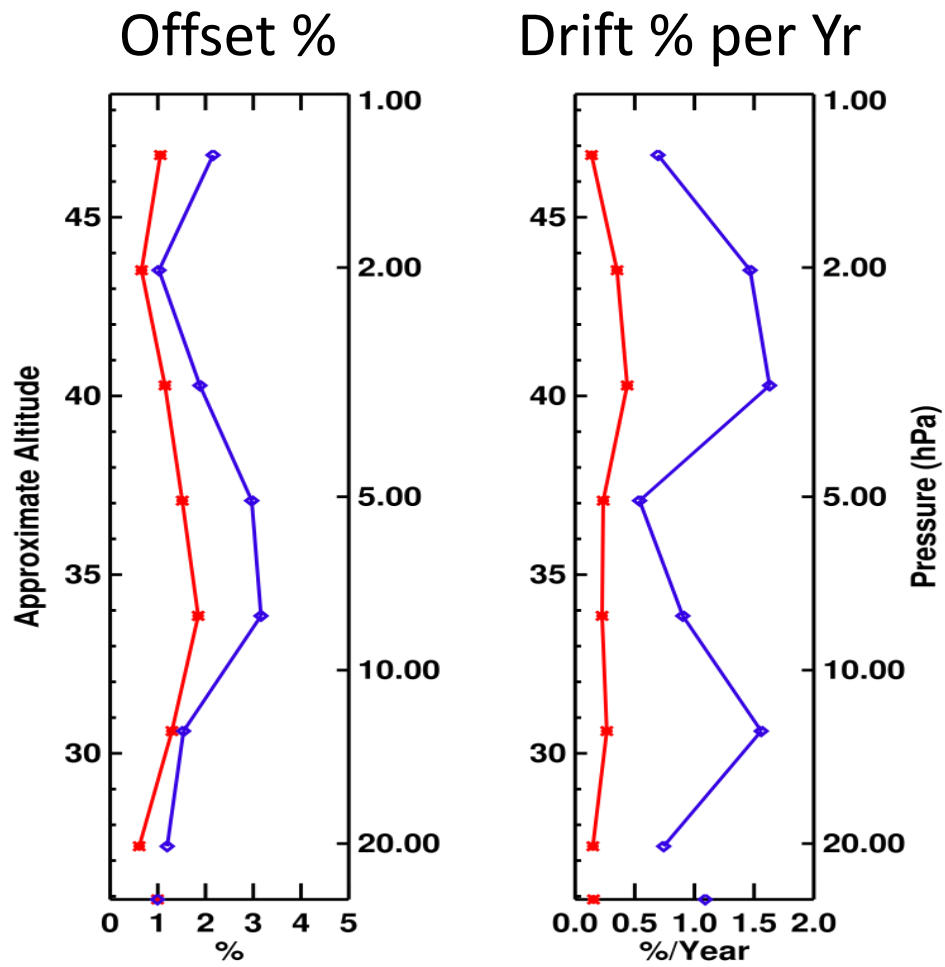


- Drifting orbits affect data quality
- Use data taken when the orbit equator crossing time is between 8am and 4pm
- Do not use N9 profile data; extend use of N11 data to avoid coverage gap
- No offsets applied; run risk of inducing trends
- Average during overlap periods

SBUV Anomaly Time Series at 45-50N

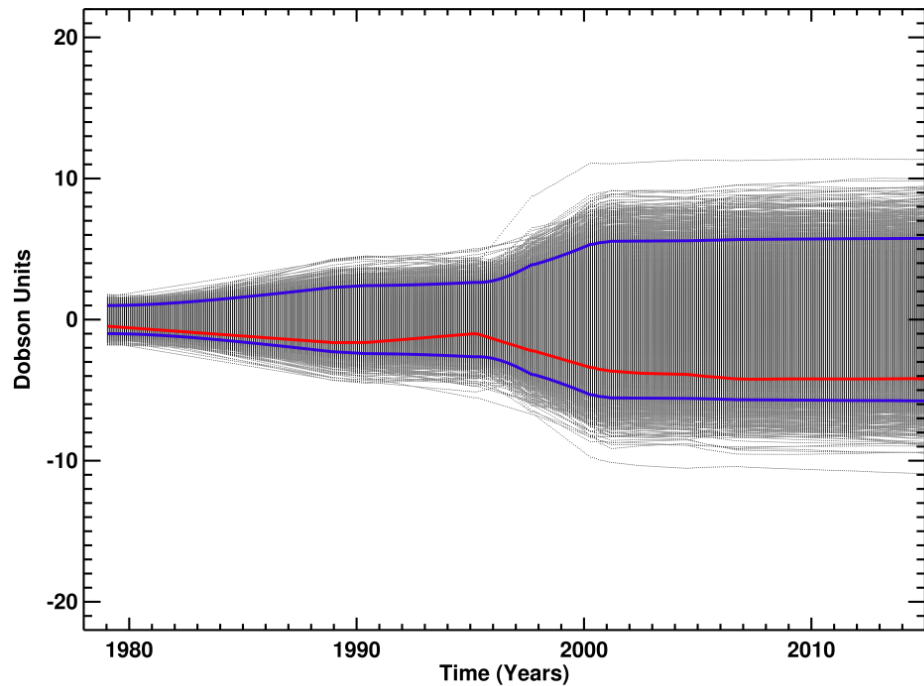


Monte Carlo Model Parameters

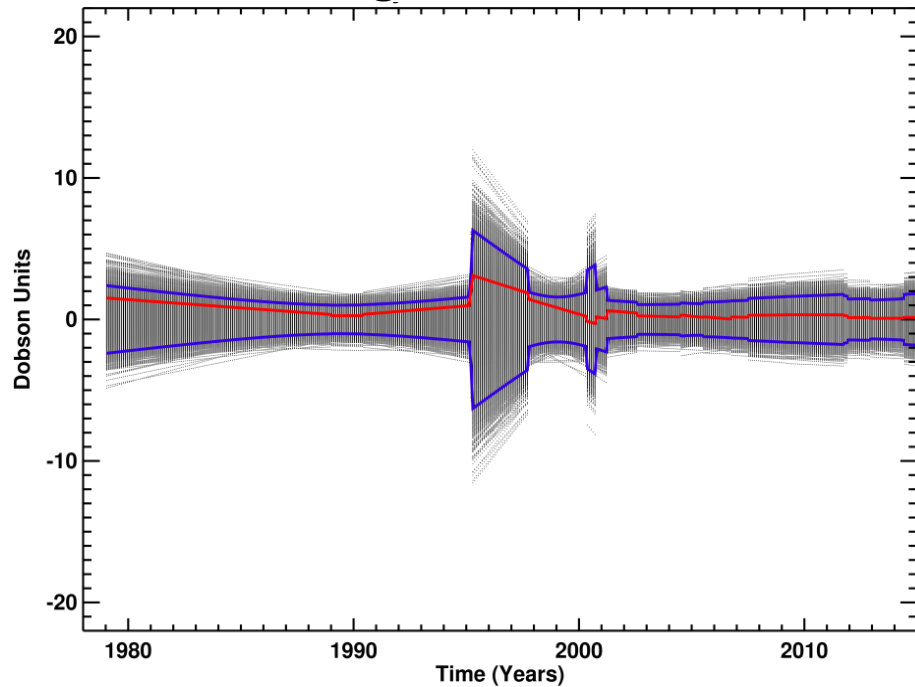


Example Monte Carlo Simulations

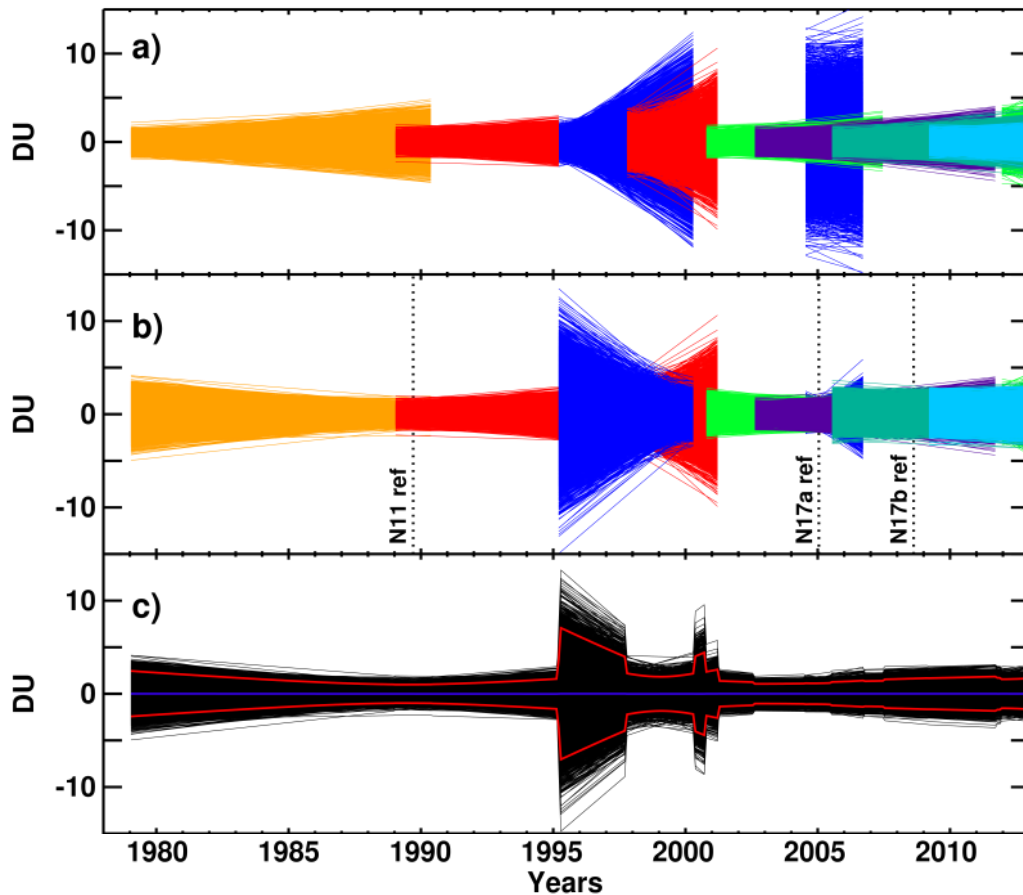
Sequential Calibration



SBUV Algorithm Calibration



SBUV MOD Monte Carlo Model Construction

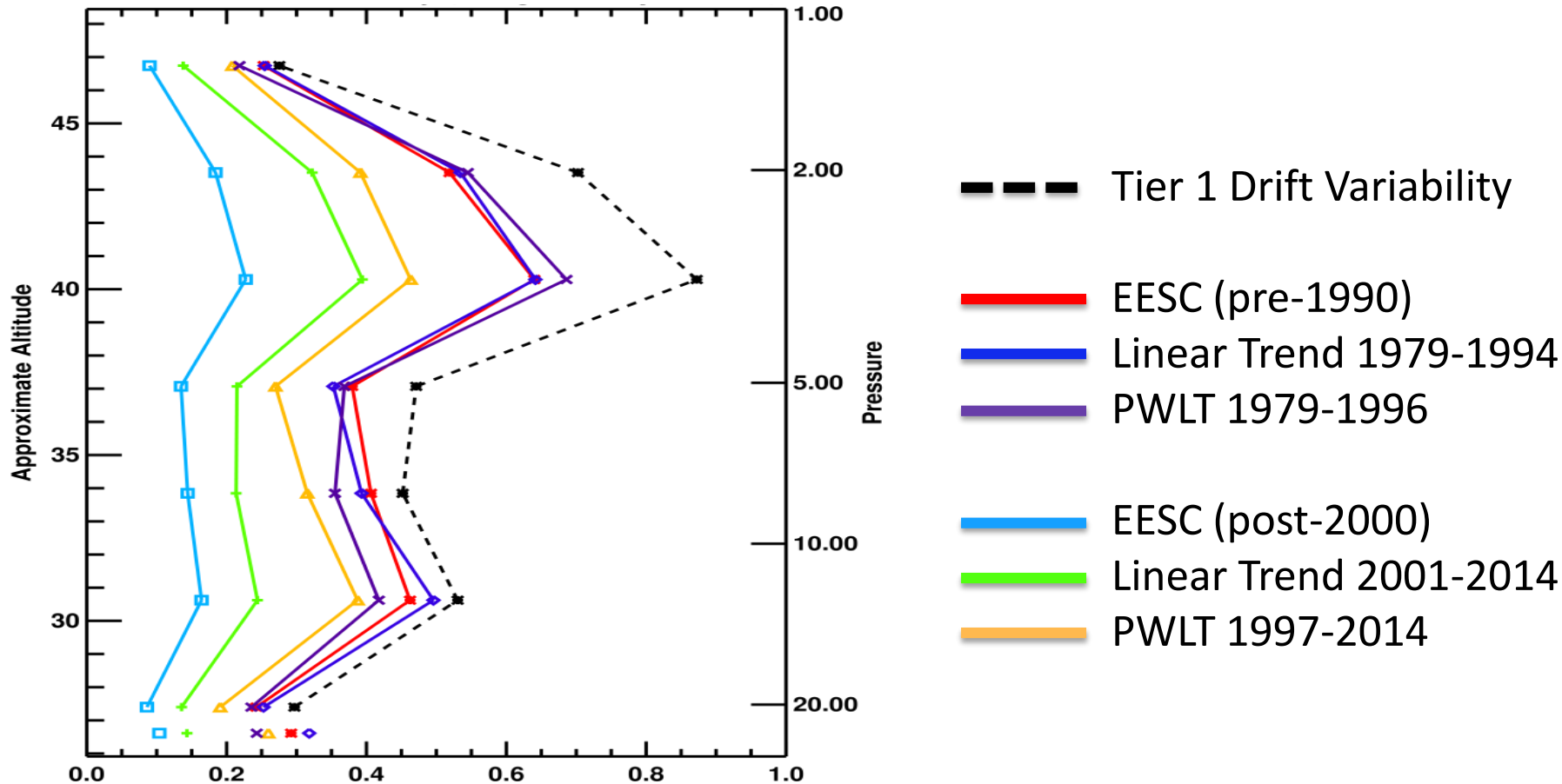


Initial uncertainty simulations

Replicate V8.6 calibration to
N11 and N17 references

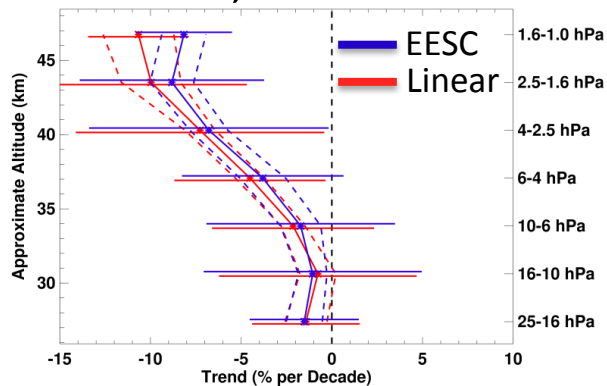
Merge individual instrument
simulations following MOD
procedure.

Estimated 2- σ Uncertainty

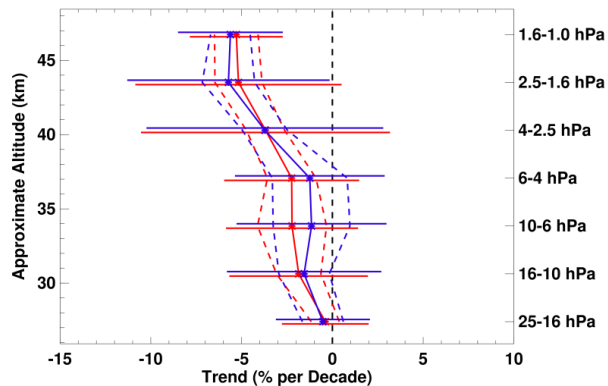


EESC and Linear Segment Fits; 1979-1994 and 2001-2014

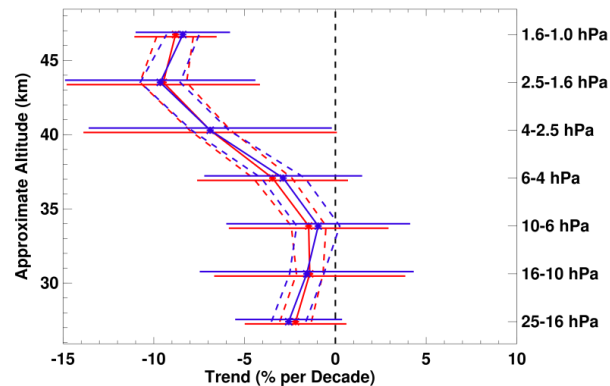
45-50S; 1979-1994



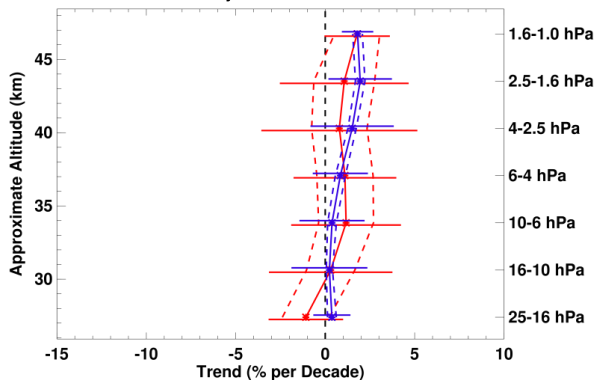
0-5N; 1979-1994



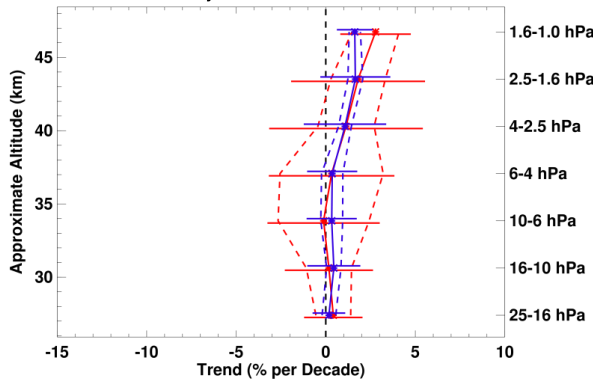
45-50N; 1979-1994



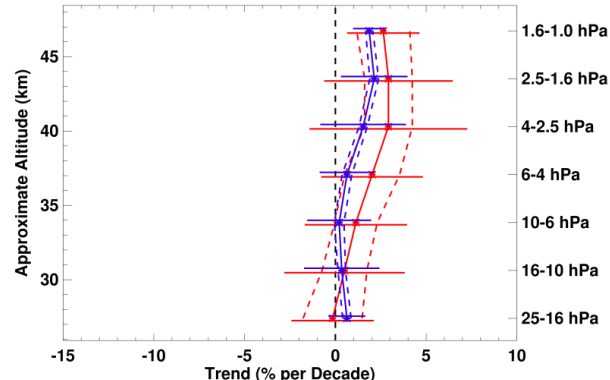
45-50S; 2001-2014



0-5N; 2001-2014



45-50N; 2001-2014



Summary and Remaining Issues

The MOD data set is uniquely qualified for use in long-term ozone analysis because of its long record, high spatial coverage, and consistent instrument design and algorithm.

The estimated MOD uncertainty term significantly increases the uncertainty over the statistical error alone. Trends in the post-2000 period are generally positive in the upper stratosphere, but only significant at 1-1.6 hPa.

Remaining uncertainties not yet included in the Monte Carlo model are

- Smoothing Error ($\sim 1\%$ from 10 to 1 hPa)
- Relative calibration uncertainty between N11 and N17
- Seasonal cycle differences between SBUV records